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Chen et al.

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(54) **VARYING HOME NETWORK ENCRYPTION TECHNIQUES**

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Related U.S. Application Data

(62) Division of application No. 12/328,007, filed on Dec. 4, 2008, now Pat. No. 8,250,362.

(51) **Int. Cl.**

G06F 11/00	(2006.01)
H04L 29/06	(2006.01)
H04N 21/436	(2011.01)
H04N 21/4367	(2011.01)
H04N 21/4408	(2011.01)

(52) **U.S. Cl.**

CPC ***H04L 63/0428*** (2013.01); ***H04L 63/162*** (2013.01); ***H04N 21/4367*** (2013.01); ***H04N 21/43615*** (2013.01); ***H04N 21/4408*** (2013.01)

(58) **Field of Classification Search**

CPC H04N 21/2347; H04N 7/1675; H04N 21/23476; H04N 21/44055; G06F 11/16

See application file for complete search history.

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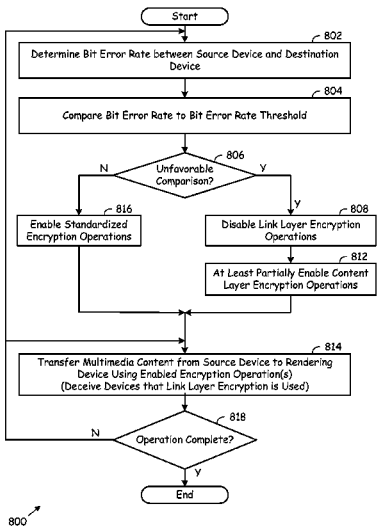
(57) **ABSTRACT**

A premises based multimedia communication system includes a source device that produces multimedia content, a rendering device that presents the multimedia content, and a premises communication network coupling the source device to the rendering device. The system determines a bit error rate of the premises communication network, transfers the multimedia content from the source device to the rendering device, and when the bit error rate exceeds a bit error rate threshold, the system at least partially disables link layer encryption of video frames of the multimedia content transfer. With the link layer operations at least partially disabled, the system can enable, at least partially, content layer encryption operations for the transfer of the multimedia content from the source device to the rendering device.

20 Claims, 13 Drawing Sheets



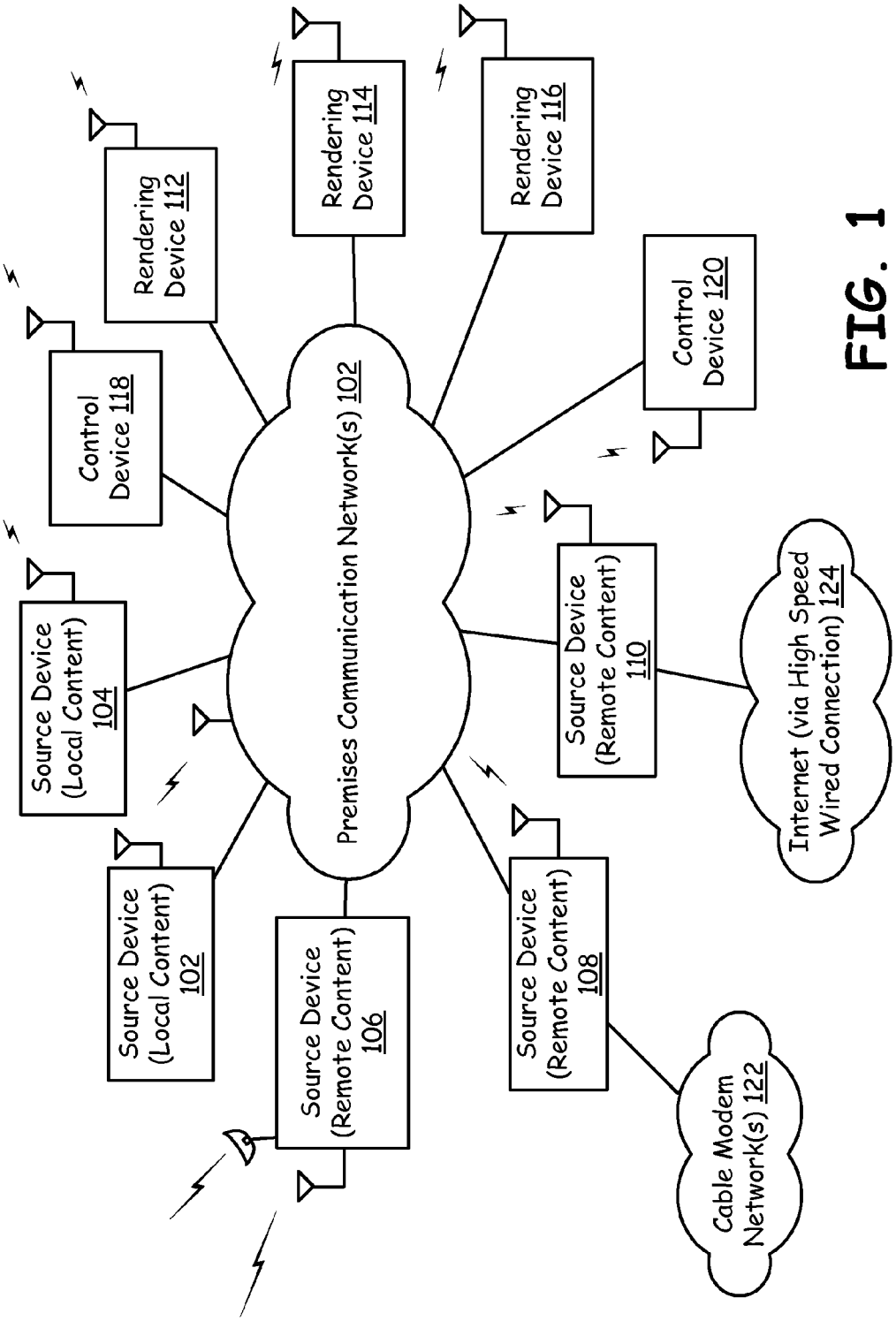

Premises Communication Network(s) 102
Source Device (Local Content) 102
Source Device (Local Content) 104
Source Device (Remote Content) 106
Source Device (Remote Content) 108
Source Device (Remote Content) 110
Rendering Device 112
Rendering Device 114
Rendering Device 116
Control Device 118
Control Device 120
Internet (via High Speed Wired Connection) 124
Cable Modem Network(s) 122

FIG. 1

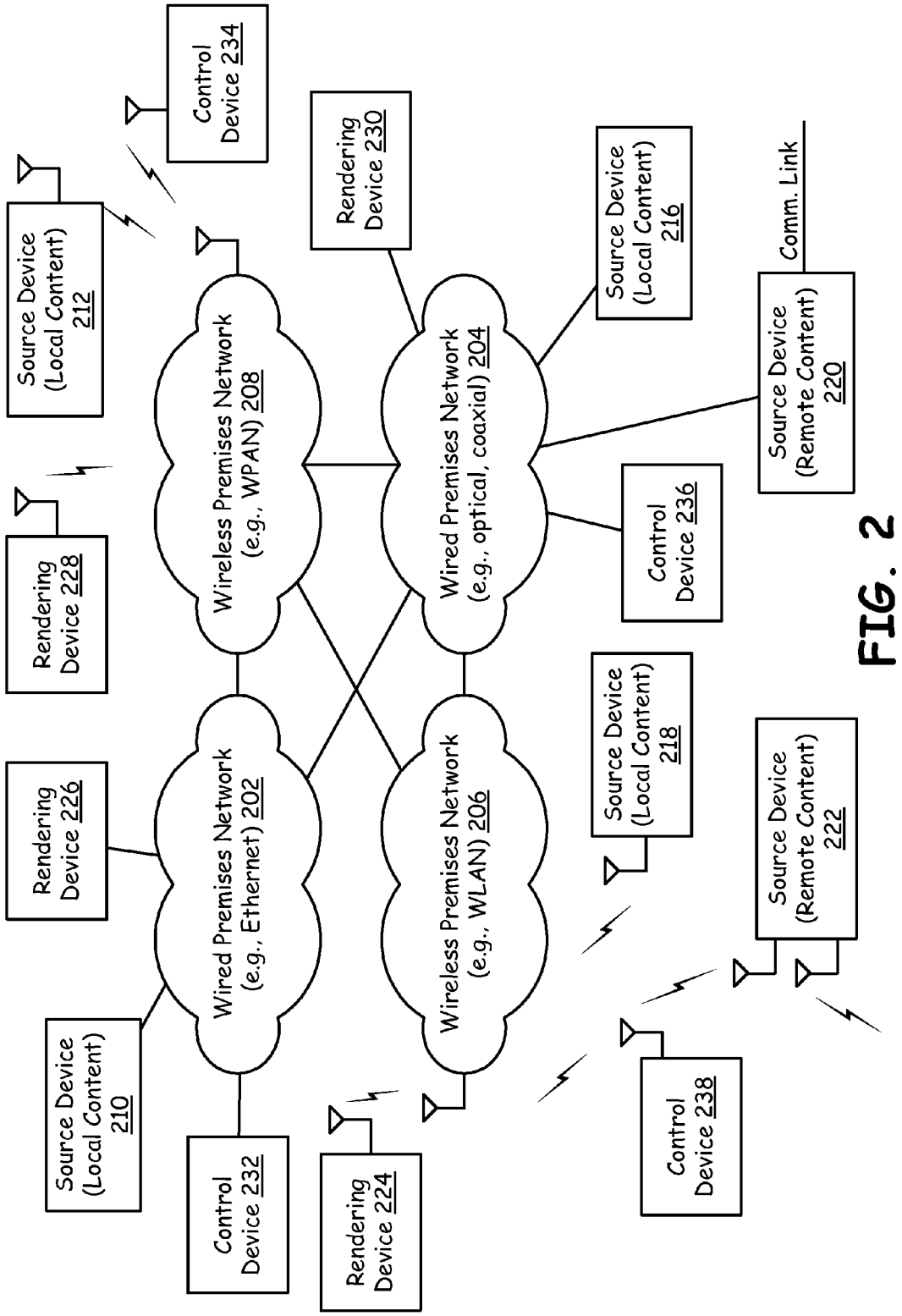

Control Device 234
Source Device (Local Content) 212
Rendering Device 228
Rendering Device 226
Source Device (Local Content) 210
Control Device 232
Rendering Device 224
Rendering Device 230
Source Device (Local Content) 216
Comm. Link
Source Device (Remote Content) 220
Control Device 236
Source Device (Local Content) 218
Source Device (Remote Content) 222
Control Device 238
Wireless Premises Network (e.g., WPAN) 208
Wired Premises Network (e.g., optical, coaxial) 204
Wired Premises Network (e.g., Ethernet) 202
Wireless Premises Network (e.g., WLAN) 206

FIG. 2

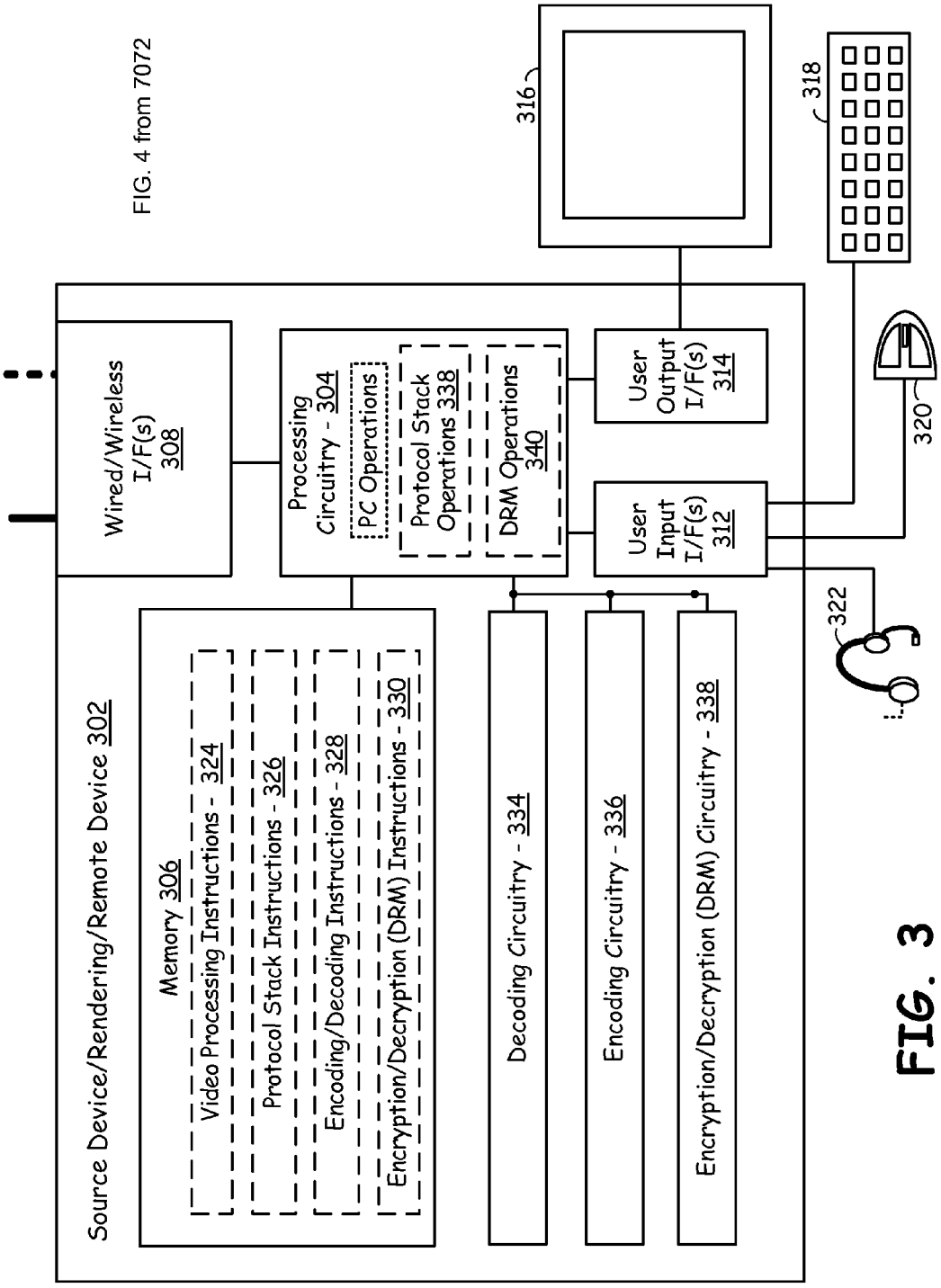


FIG. 4 from 7072
Source Device/Rendering/Remote Device 302
Wired/Wireless I/F(s) 308
Processing Circuitry - 304
PC Operations
Protocol Stack Operations 338
DRM Operations 340
User Output I/F(s) 314
User Input I/F(s) 312
Memory 306
Video Processing Instructions - 324
Protocol Stack Instructions - 326
Encoding/Decoding Instructions - 328
Encryption/Decryption (DRM) Instructions - 330
Decoding Circuitry - 334
Encoding Circuitry - 336
Encryption/Decryption (DRM) Circuitry - 338
316
318
320
322

FIG. 3

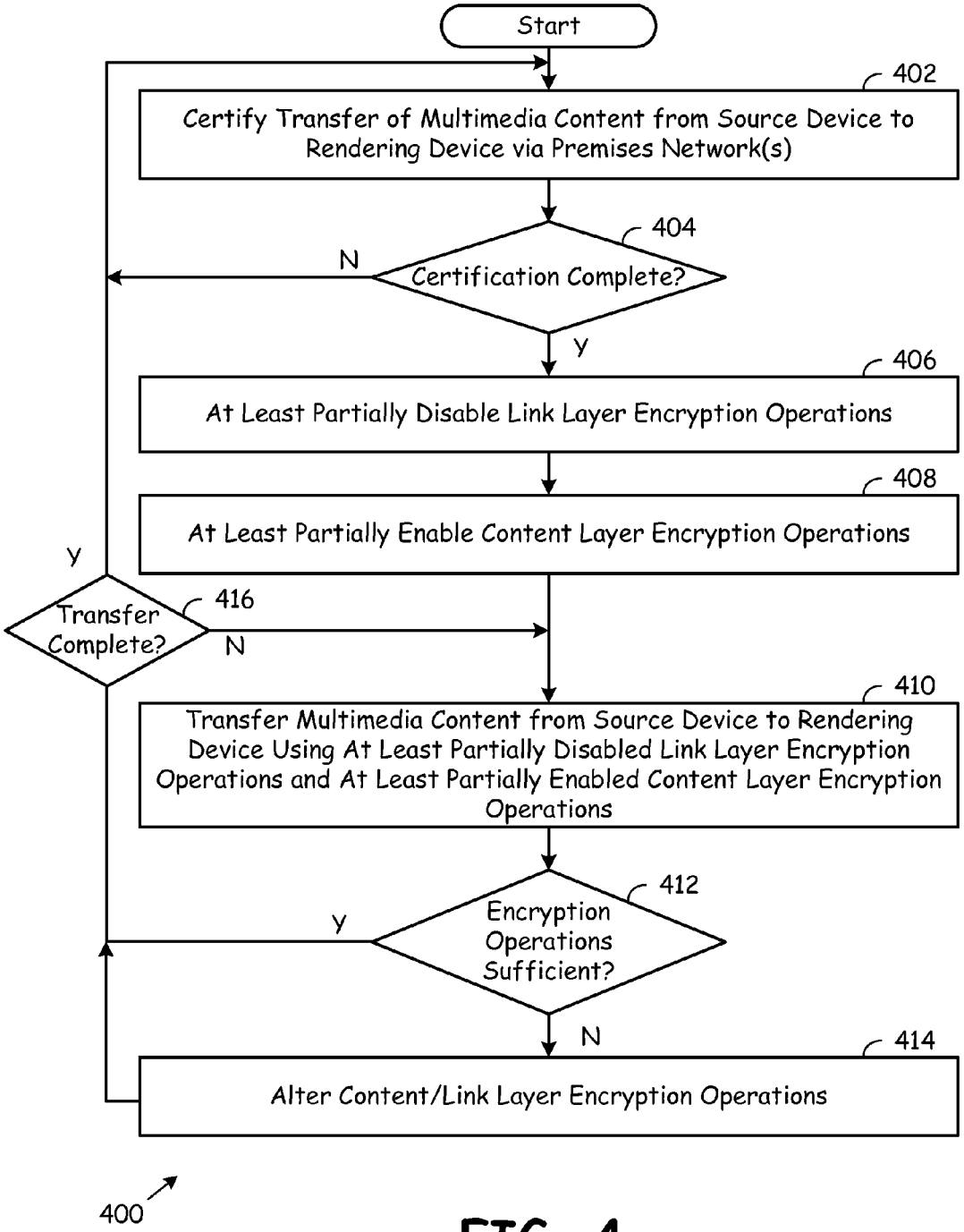

Start
402
Certify Transfer of Multimedia Content from Source Device to Rendering Device via Premises Network(s)
404
Certification Complete?
N
Y
406
At Least Partially Disable Link Layer Encryption Operations
408
At Least Partially Enable Content Layer Encryption Operations
Y
Transfer Complete?
416
N
410
Transfer Multimedia Content from Source Device to Rendering Device Using At Least Partially Disabled Link Layer Encryption Operations and At Least Partially Enabled Content Layer Encryption Operations
412
Encryption Operations Sufficient?
Y
N
414
Alter Content/Link Layer Encryption Operations
400

FIG. 4

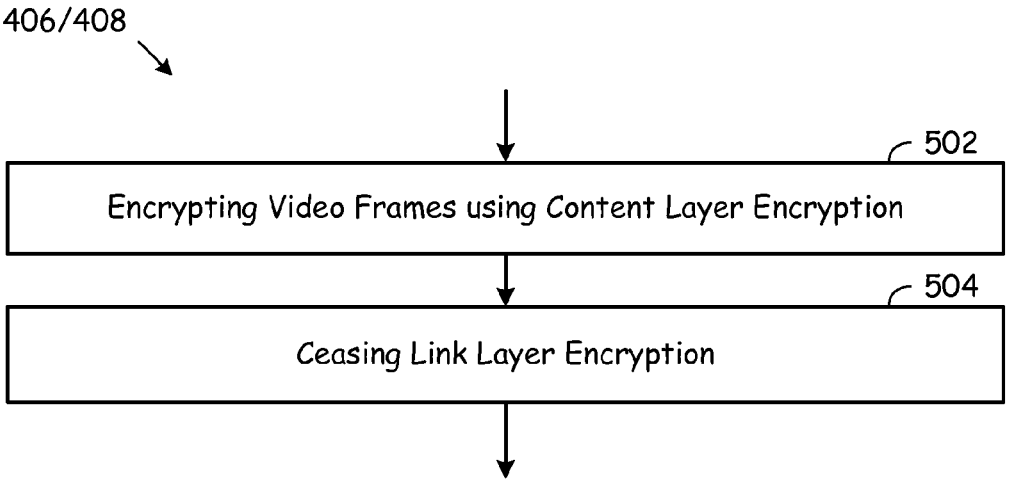

406/408
502
Encrypting Video Frames using Content Layer Encryption
504
Ceasing Link Layer Encryption

FIG. 5A

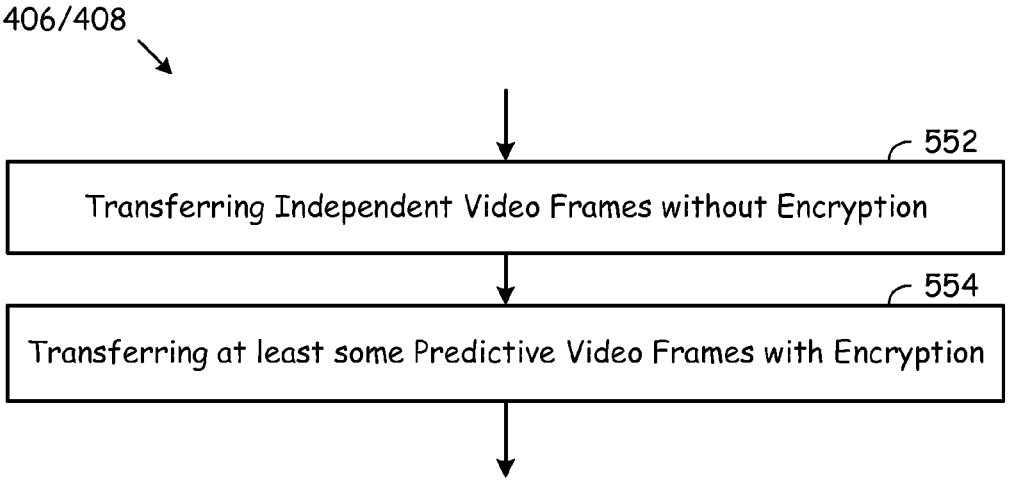

406/408
552
Transferring Independent Video Frames without Encryption
554
Transferring at least some Predictive Video Frames with Encryption

FIG. 5B

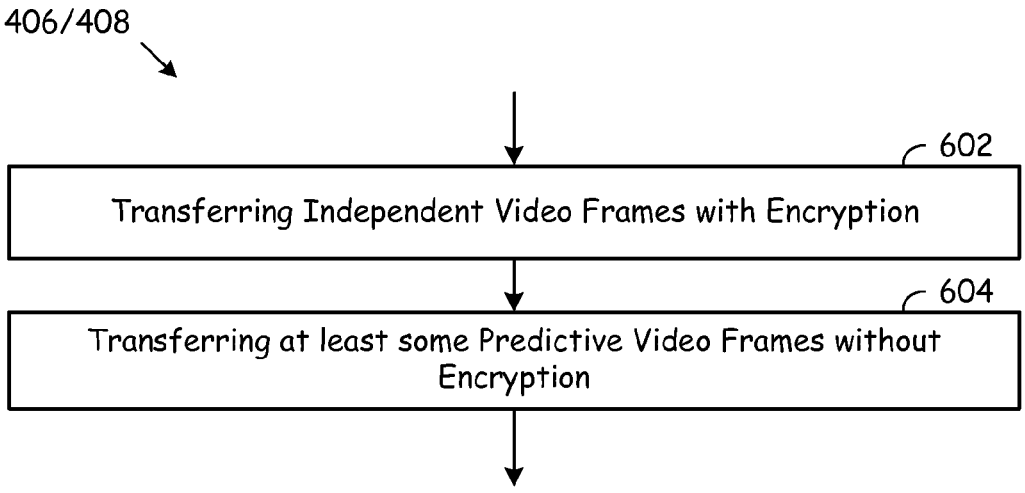

406/408
602
Transferring Independent Video Frames with Encryption
604
Transferring at least some Predictive Video Frames without Encryption

FIG. 6A

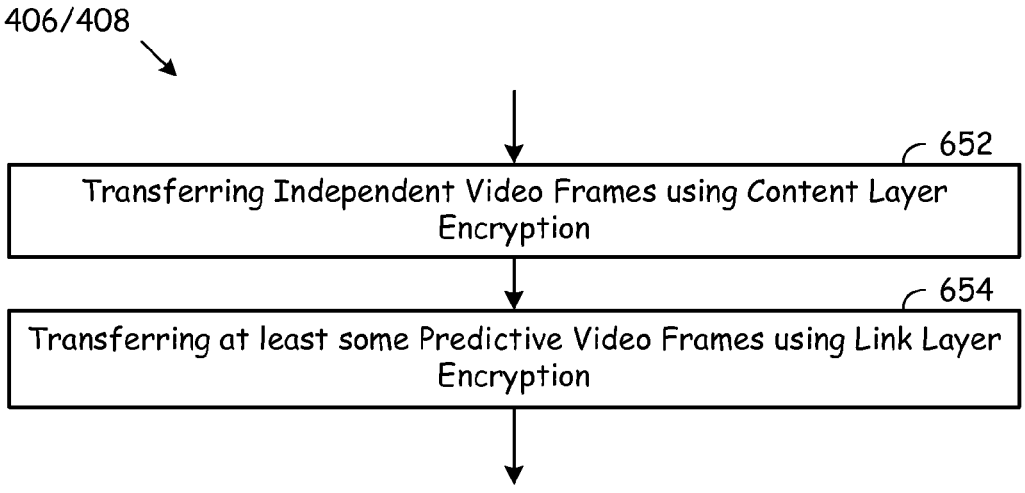

406/408
652
Transferring Independent Video Frames using Content Layer Encryption
654
Transferring at least some Predictive Video Frames using Link Layer Encryption

FIG. 6B

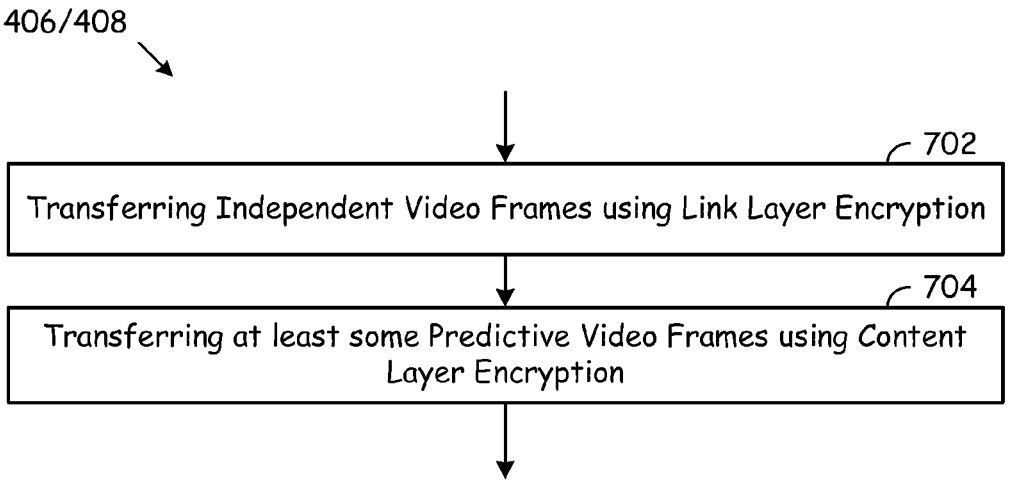

406/408
702
Transferring Independent Video Frames using Link Layer Encryption
704
Transferring at least some Predictive Video Frames using Content Layer Encryption

FIG. 7

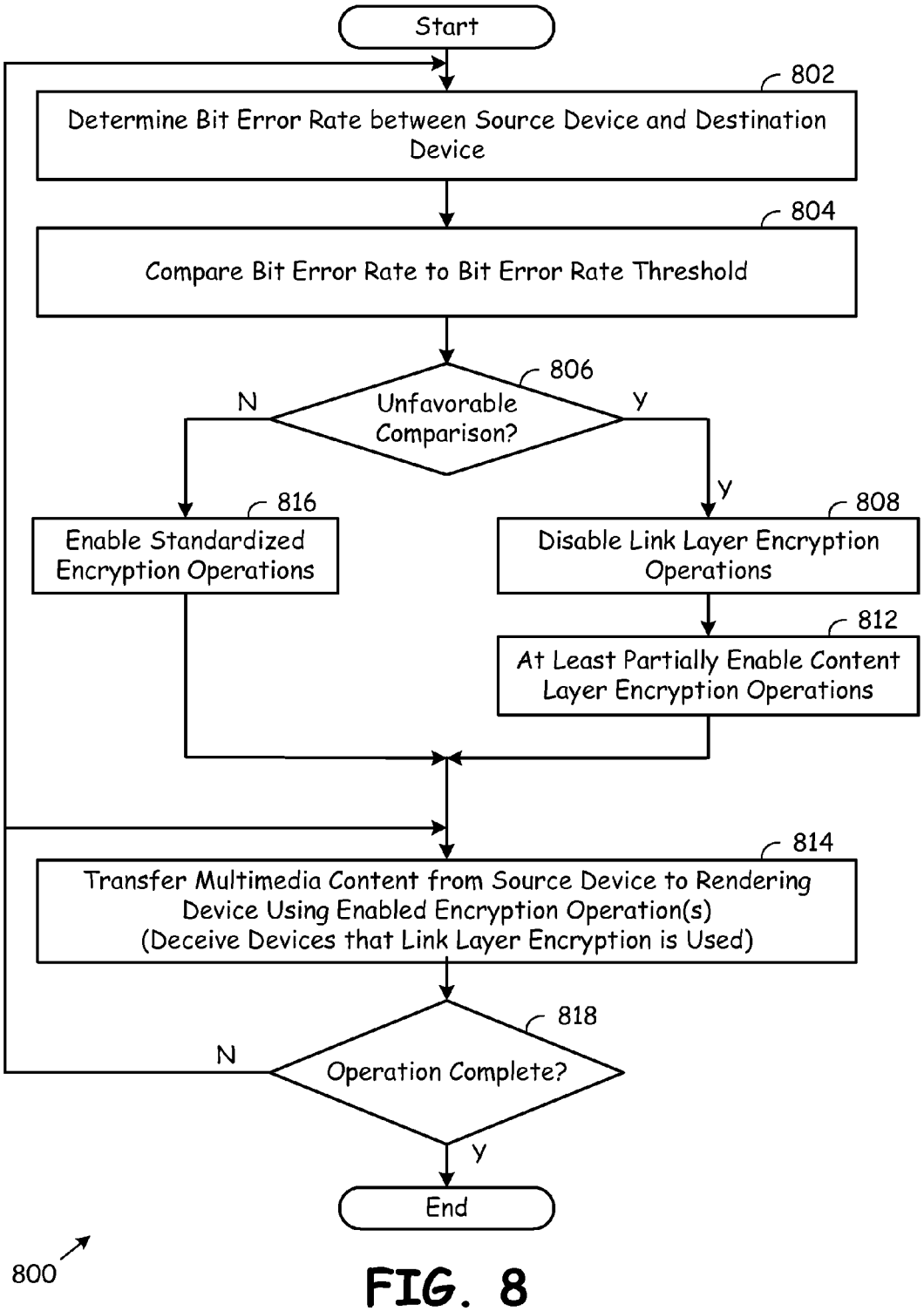

Start
802
Determine Bit Error Rate between Source Device and Destination Device
804
Compare Bit Error Rate to Bit Error Rate Threshold
806
Unfavorable Comparison?
N
Y
Y
816
Enable Standardized Encryption Operations
808
Disable Link Layer Encryption Operations
812
At Least Partially Enable Content Layer Encryption Operations
814
Transfer Multimedia Content from Source Device to Rendering Device Using Enabled Encryption Operation(s) (Deceive Devices that Link Layer Encryption is Used)
818
Operation Complete?
N
Y
End
800

FIG. 8

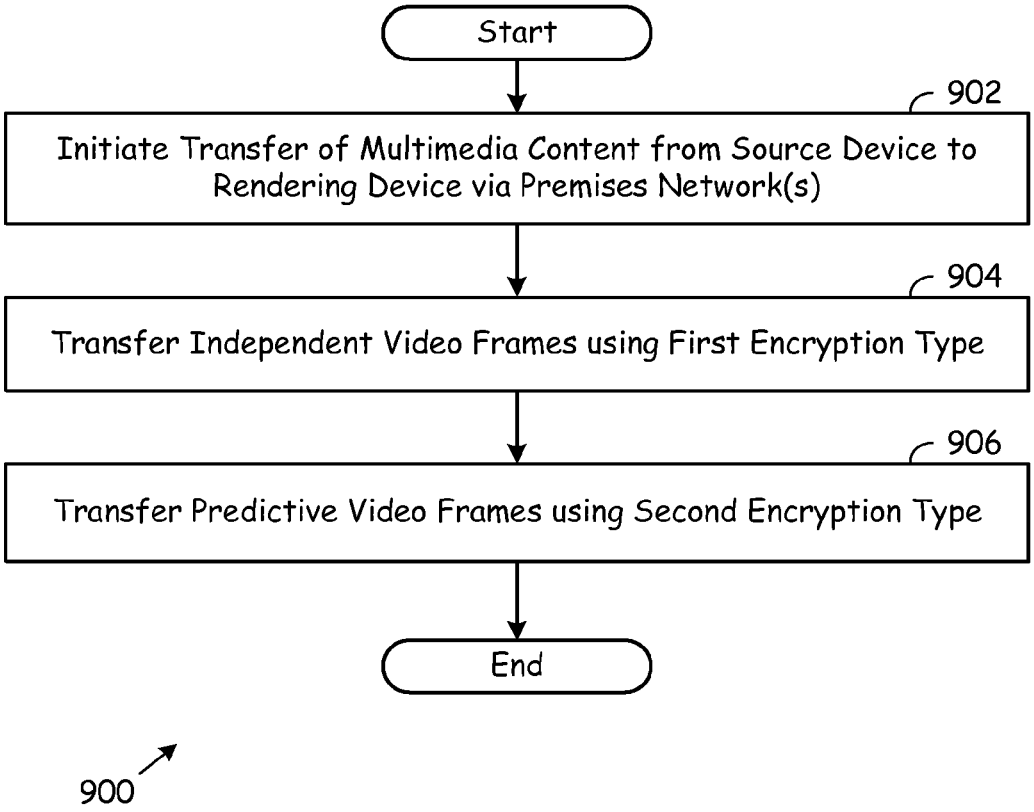

Start
902
Initiate Transfer of Multimedia Content from Source Device to Rendering Device via Premises Network(s)
904
Transfer Independent Video Frames using First Encryption Type
906
Transfer Predictive Video Frames using Second Encryption Type
End
900

FIG. 9

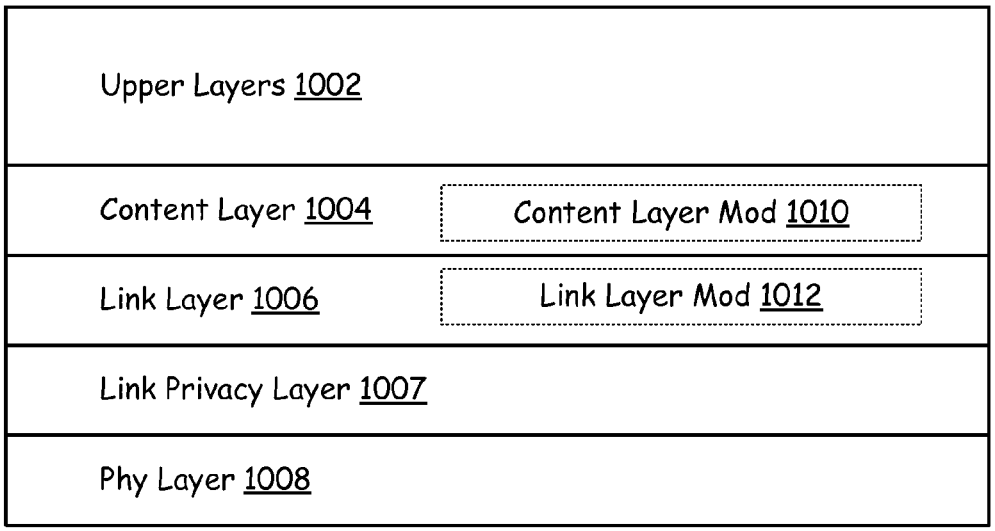


FIG. 10A

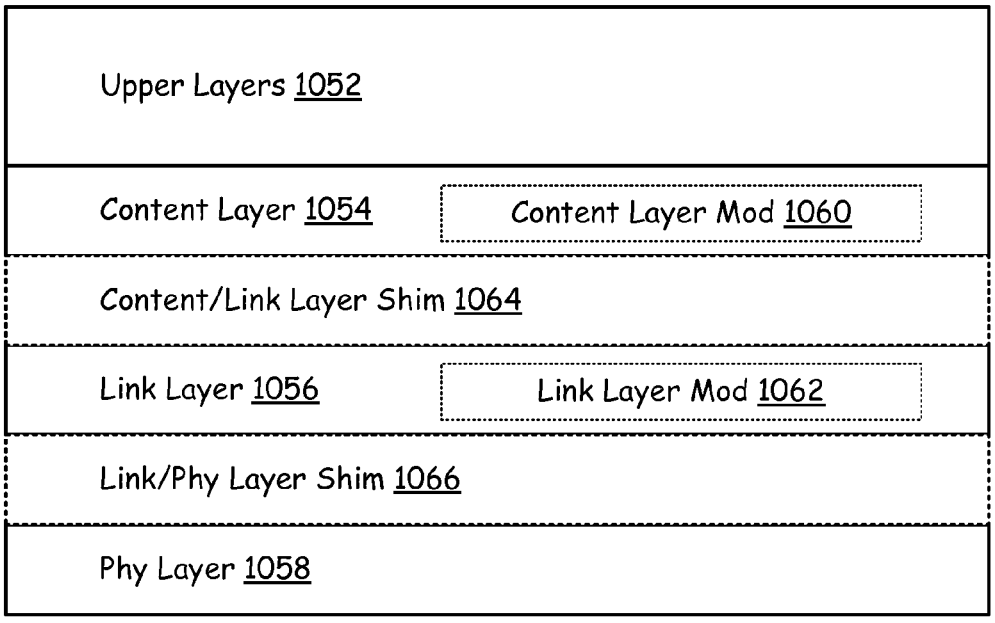


FIG. 10B

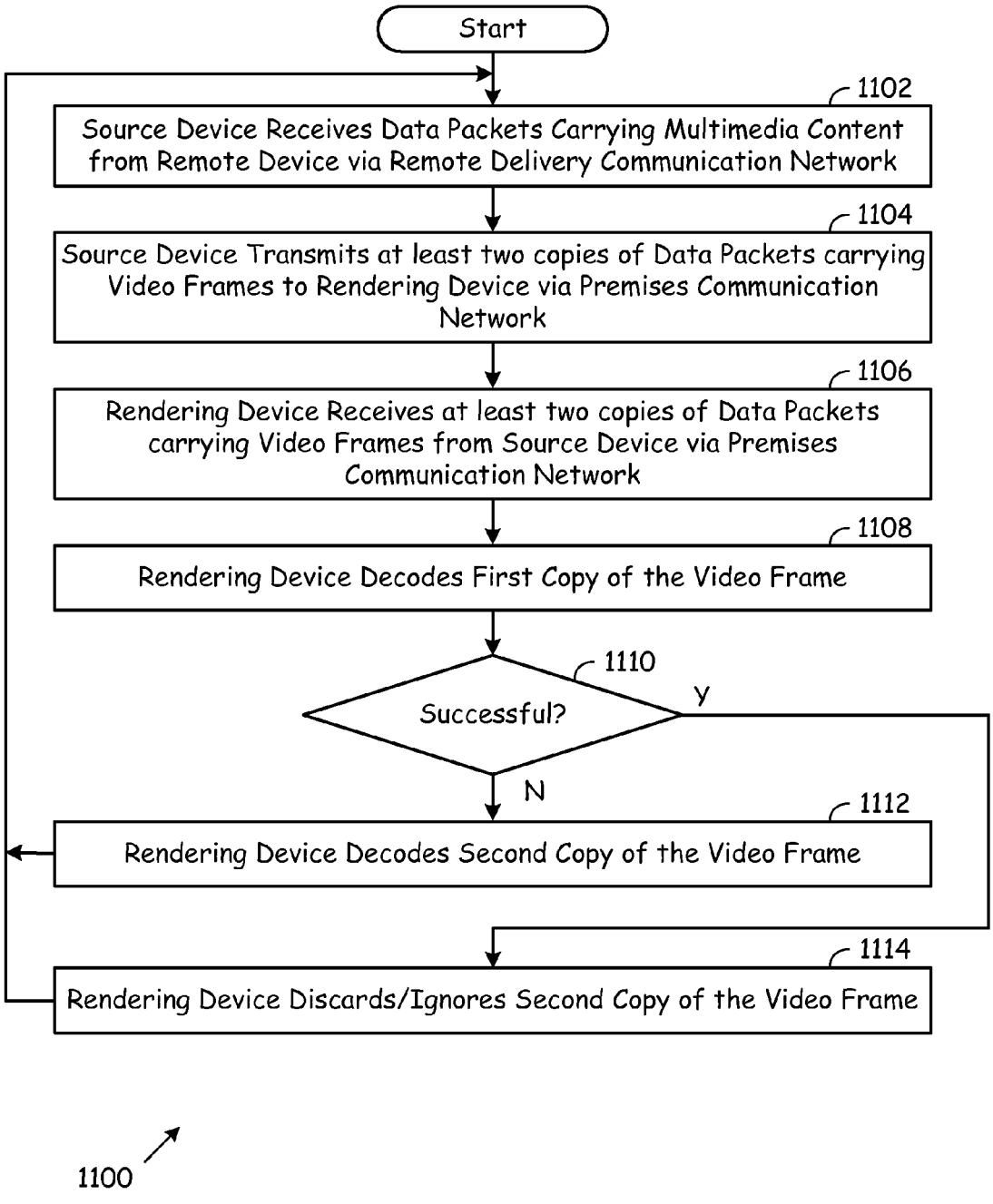

Start
1102
Source Device Receives Data Packets Carrying Multimedia Content from Remote Device via Remote Delivery Communication Network
1104
Source Device Transmits at least two copies of Data Packets carrying Video Frames to Rendering Device via Premises Communication Network
1106
Rendering Device Receives at least two copies of Data Packets carrying Video Frames from Source Device via Premises Communication Network
1108
Rendering Device Decodes First Copy of the Video Frame
1110
Successful?
Y
N
1112
Rendering Device Decodes Second Copy of the Video Frame
1114
Rendering Device Discards/Ignores Second Copy of the Video Frame
1100

FIG. 11

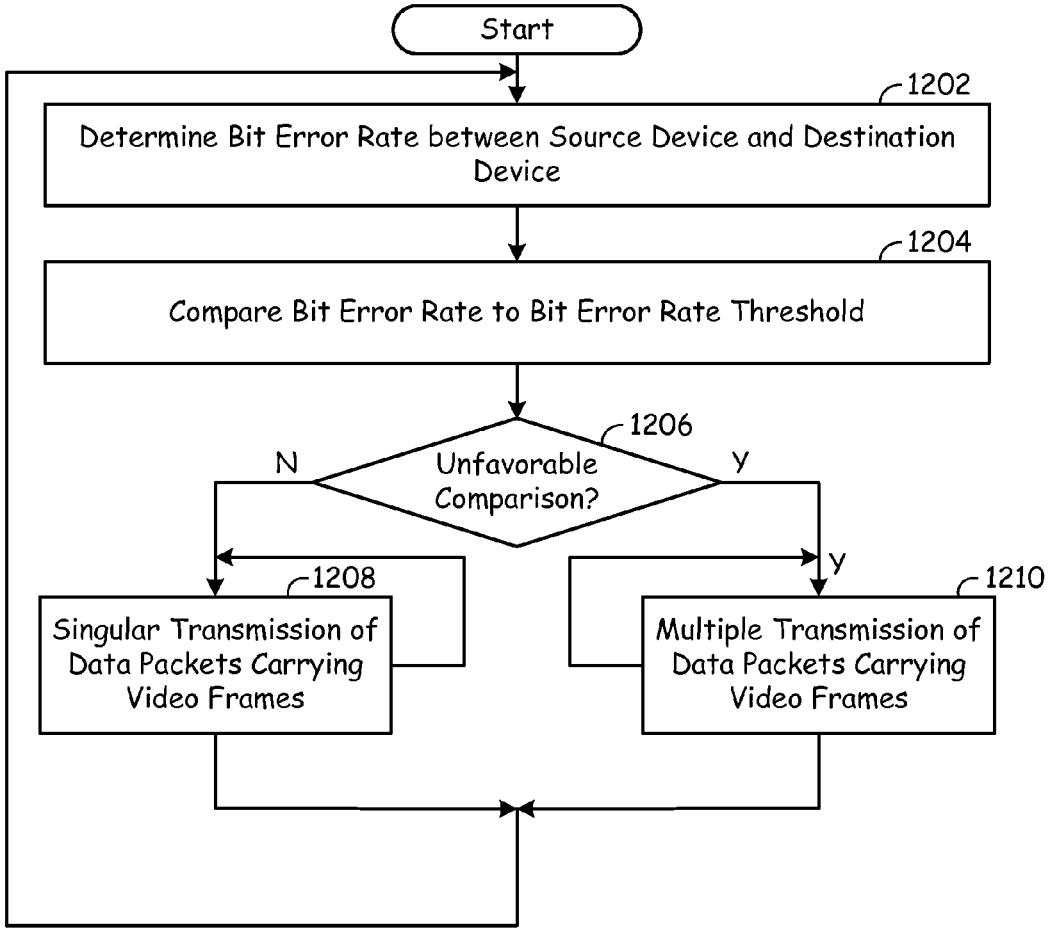

Start
1202
Determine Bit Error Rate between Source Device and Destination Device
1204
Compare Bit Error Rate to Bit Error Rate Threshold
1206
Unfavorable Comparison?
N
Y
1208
Singular Transmission of Data Packets Carrying Video Frames
Y
1210
Multiple Transmission of Data Packets Carrying Video Frames
1200

FIG. 12

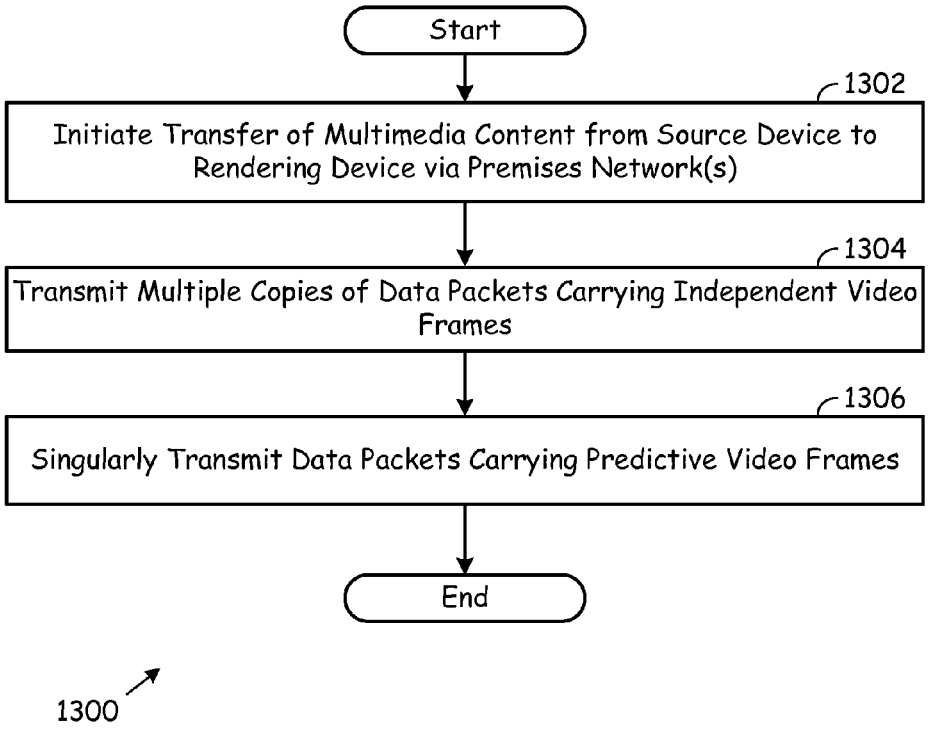

Start
1302
Initiate Transfer of Multimedia Content from Source Device to Rendering Device via Premises Network(s)
1304
Transmit Multiple Copies of Data Packets Carrying Independent Video Frames
1306
Singularly Transmit Data Packets Carrying Predictive Video Frames
End
1300

FIG. 13

VARYING HOME NETWORK ENCRYPTION TECHNIQUES

CROSS REFERENCE TO PRIORITY APPLICATION

The present U.S. Utility Patent Application claims priority pursuant to 35 U.S.C. §120, as a divisional, to the following U.S. Utility Patent Application which is hereby incorporated herein by reference in its entirety and made part of the present U.S. Utility Patent Application for all purposes:

U.S. Utility application Ser. No. 12/328,007 filed on Dec. 4, 2008, and entitled "HOME NETWORK ENCRYPTION TECHNIQUES", issued as U.S. Pat. No. 8,250,362 on Aug. 21, 2012.

BACKGROUND

1. Technical Field

The present invention relates generally to the packetized transmission of video and audio information; and, more particularly, to the encryption/decryption and transfer of multimedia content.

2. Related Art

The structure and operation of communication systems is generally known. Communication systems include both wired and wireless communication systems. Examples of wired communication systems are the Public Switched Telephone Network (PSTN), packet switched telephone networks, optical networks, cable networks, Local Area Networks (LANS) such as Ethernet networks, and various other wired networks that communicably couple serviced devices via wired links. Wireless communication systems includes cellular communication systems, Wireless Wide Area Networks (WWANs) such as WiMAX communication systems, satellite based communication systems, fixed wireless communication system, Wireless Local Area Networks (WLANs), and Wireless Personal Area Networks (WPANs), among other wireless networks. The structure and operation of these networks are generally known.

The transport of multimedia content is also generally known. Multimedia content typically includes video content, audio content, metadata, and control information. For example, in a satellite television system, multimedia content stored in a first location or captured via video cameras and sound systems that are at a respective location, e.g., sports stadium, are transferred wirelessly from the content source/capture location via the satellite communication system to a receiving device. The receiving device typically includes both a satellite receiver and a rendering device such as a television and/or multimedia entertainment system. An example of such a structure includes a home based television system that receives the multimedia content via the satellite communication network receiver. A similar structure exists within a cable television communication system where a rendering device couples to a cable television receiver that receives multimedia content from a remote location via the cable network. Broadcast television systems, which have been known for many years, broadcast multimedia content to local recipients that receive such multimedia content via receiving devices. In all cases, one or more rendering devices within the premises, for example at home, will receive and present the multimedia content to one or more users.

Home based/premises based multimedia communication systems typically include source devices, communication networks, and rendering devices. Rendering devices may include, for example, video monitors, surround sound systems, whole house audio networks, combination devices that present both audio and video content, and/or a combination of these. Source devices include receivers of remotely stored/generated content and local storage of the multimedia content. The local storage may include hard disk drives and videotape recording devices, for example. The local storage may receive multimedia content from a remote source via another source device, for example, and store the multimedia content locally for either immediate or later presentation by a rendering device. Further, other source devices within such a home/premises multimedia communication system may produce content from a portable storage device such as a DVD or CD. Such source devices extract multimedia content from the portable storage device and provide the multimedia content to one or more rendering devices for presentation to a user. The home/premises communication network may include one or more wired and/or wireless networks. For example, a home/premises communication network may include an Ethernet network, a cable network, an optical network, and/or one or more wireless networks, which may include one or more WLANS, WPANS, and/or other wireless communication enabling networks.

Various problems exist with regard to not only the receipt but with the presentation of multimedia content within a home/premises multimedia network as well. For example, when a source device that receives multimedia content from a remote source employs the premises communication network for transport of the multimedia content to a rendering device, various problems may exist. These problems may include, for example, selection of available premises communication networks for transport to the rendering device and overcoming a greater bit error rate of the home/premises communication network than that of a remote network that supported delivery of remotely generated content to the servicing source device. Further, Digital Rights Management (DRM) is required for the presentation of some multimedia content. For example, a source of the multimedia content may require that one or more rendering devices of the multimedia content support particular DRM operations. When the home/premises based multimedia communication systems enable the Digital Living Network Alliance (DLNA) operations, particular DRM operations are required. However, these DRM operations, which include encryption at various protocol layers may be not supportable by home/premises communication networks of the home/premises based multimedia communication systems.

These and other limitations and deficiencies associated with the related art may be more fully appreciated by those skilled in the art after comparing such related art with various aspects of the present invention as set forth herein with reference to the figures.

BRIEF SUMMARY OF THE INVENTION

The present invention is directed to apparatus and methods of operation that are further described in the following Brief Description of the Drawings, the Detailed Description of the Invention, and the claims. Other features and advantages of the present invention will become apparent from the following detailed description of the invention made with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a system diagram illustrating a premises based multimedia communication system constructed and operating according to one or more embodiments of the present invention;

FIG. **2** is a system diagram illustrating an alternate construction of a premises based multimedia communication system constructed according to one or more embodiments of the present invention;

FIG. **3** is a block diagram illustrating generally the construct of a source device, a rendering device, and/or a control device constructed according to one or more embodiments of the present invention;

FIG. **4** is a flow chart illustrating operations for the transfer of multimedia content according to an embodiment of the present invention;

FIGS. **5**A and **5**B are flow charts illustrating particular embodiments of the operations of FIG. **4**;

FIGS. **6**A and **6**B are flow charts illustrating particular embodiments consistent with the operations of FIG. **4**;

FIG. **7** is a flow chart illustrating particular embodiments consistent with the operations of FIG. **4**;

FIG. **8** is a flow chart illustrating one or more alternate embodiments of operations for the transfer of multimedia content according to the present invention;

FIG. **9** is a flow chart illustrating other embodiments of operations for the transfer of multimedia content according to the present invention;

FIGS. **10**A and **10**B illustrate various embodiments of protocol stack construct(s) supporting the operations of the present invention;

FIG. **11** is a flow chart illustrating operations of a premises based multimedia communication system according to another embodiment of the present invention;

FIG. **12** is a flow chart illustrating yet another operation of a source device of the premises multimedia communication system according to an embodiment of the present invention;

FIG. **13** is a flow chart illustrating a particular operation according to the embodiment of FIGS. **11** and **12**.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. **1** is a system diagram illustrating a premises based multimedia communication system constructed and operating according to one or more embodiments of the present invention. The premises based multimedia communication system, FIG. **1** includes at least one source device that produces multimedia content, at least one rendering device that presents the multimedia content, and at least one premises communication network coupling at least one source device to at least one rendering device. With the embodiment of FIG. **1**, a premises communication network **102** includes one or more sub networks that support wired and/or wireless networks. The premises communication network **102** will be described further in FIG. **2** and may include multiple wired networks and/or multiple wireless networks each of which supports the transfer of multimedia content between a source device and designation device. The premises based multimedia communication system may be present within a home, within a business, and/or may be present within another type of physical locale in which presentation of multimedia content is stored/transported/presented.

The multimedia content, in various embodiments of the present invention, includes audio content, video content, metadata, and/or control content. The premises communication network **102** supports packetized transport of the multimedia content. According to various embodiments of the present invention, the audio and/or video content is transported using a encoding/encryption technique in a packetized fashion. For example, the multimedia content may employ one or more versions of the Motion Pictures Expert Group (MPEG) standardized operations, one or more embodiments of the Joint Photographic Experts Group (JPEG) standards, one or more of the embodiments of the MPEG Layer-3 Audio (MP3) standards, and/or various other audio, video, and/or image compressions/encoding standards.

Techniques for transferring video frames of the multimedia content will be described in detail herein. As is known, the MPEG standard supports generation of independent video frames and predictive video frames. Generally, independent video frames are referred to by the "I" nomenclature while predictive video frames are referred to with the "B" and/or "P" nomenclature. The B nomenclature for predictive video frames refers to a backward predictive video frame while a P nomenclature for predictive video frame refers to a forward predictive video frame. As is generally known, an encoder encodes raw video information according to the MPEG standard to produce a sequence of I, B, and P video frames. These video frames are packetized and transported to a decoding device, particularly a rendering device. The rendering device includes the decoder and reconstructs a video sequence from the I, B, and P video frames received from the source device. The video stream that the decoder produces is presented to a user by a rendering device or stored within the system for future presentation. Likewise, although much less complicated, a source device encodes raw audio information using the MP3 standard, for example. In a fashion similar to the video encoding and decoding operations, the raw audio is encoded, and transported to a rendering device. The rendering device includes an audio decoder that constructs output audio from the input encoded audio stream and then presents the output audio to a user or stores the audio data. Of course, a different audio encoding/decoding standard may be employed to support transport of audio from a source device to a rendering device.

The multimedia communication system of FIG. **1** includes a plurality of source devices **102** and **104** that locally produces multimedia content. Examples of source devices **102** and **104** that locally produce multimedia content include CD players, DVD players, VCR players, video cameras, audio recorders, personal computers having hard drives and any other type of electronic device that is capable of locally providing multimedia content to the premises communications network **102**. The source devices **102** and **104** couple to the premises communication network **102** via one or more of wired and/or wireless communication links.

The multimedia communication system of FIG. **1** further includes source devices **106**, **108**, and **110** that receive multimedia content from a remote location via a remote communication network. For example, source device **106** receives multimedia content from a remote location according to one or more supported interface operations, which may include satellite based communications, cellular based communications, WAN based communications, fixed wireless based communications, or other wireless based communications. The source device **106**, for example, may be a satellite set-top box that includes a digital video recorder, which receives multimedia content via a satellite from an earth base satellite communications transmitter. The source device **106** wired and/or wirelessly couples to the premises communication network **102** and uses the premises communication network **102** to transport multimedia content to a rendering device **112**, for example.

Source device **108** couples to a cable modem network **122** and is operable to receive multimedia content from the cable modem network **122**. Source device **110** couples to the Internet **124** via one or more high speed wired connections. Each of source devices **108** and **110** receives multimedia content from a remote content source and may include local storage to

store the multimedia content prior to transmitting the multimedia content to a rendering device via the premises communication network **102**.

The premises multimedia communication system of FIG. **1** further includes a plurality of rendering devices **112**, **114**, and **116**. These rendering devices **112**, **114**, and/or **116** receive multimedia content via the premises communication network **102** from one or more source devices and present the multimedia content to one or more users. The rendering devices **112**, **114** and **116** couple to the premises communication network **102** via wired and/or wireless communication links. Examples of the rendering devices **112** and **114**, and **116** includes video monitors, surround sound audio systems, handheld video players, whole house speaker systems, personal computers, and/or any various other devices that is capable of presenting at least some multimedia content to a user.

The multimedia communication system of FIG. **1** further includes a plurality of control devices **118** and **120**. The control devices **118** and **120** may be employed to monitor and/or control the transfer of multimedia content within the multimedia communication system. For example, in some operations, one or more of the control devices **118** and **120** may identify multimedia content being transferred based upon meta data included in the multimedia content. In such case, the control device **118** and/or **120** determines whether better content exists somewhere within the multimedia communication system or external to the multimedia communication system. In such case, the control device **118** and/or **120** may alter the transfer of such multimedia content to secure a different source. In other operations, the control devices **118** and/or **120** may be employed to establish the transfer of multimedia content from a source device to a rendering device. In such case, the control device **118** and **120** may alter the transmission path and selected rendering device during the presentation of such multimedia content. In still other operations, the control device **118** and **120** may simply be employed to select preferred rendering devices based upon system conditions and/or to select a preferred portion of the premises communication network **102** to use for the transfer of multimedia content from a content source to a rendering device.

FIG. **2** is a system diagram illustrating an alternate construction of a premises based multimedia communication system constructed according to one or more embodiments of the present invention. As shown in FIG. **2**, the premises based multimedia communication system includes a plurality of differing premises communication networks. These premises communication networks include a wired premises network **202**, a wireless premises network **208**, a wireless premises network **206**, and a wired premises network **204**. In the particular embodiment of FIG. **2**, wired premises network **202** is an Ethernet network, wireless premises network **208** is a wireless personal area network (WPAN), wireless premises network **206** is a wireless local area network (WLAN), and wired premises network **204** is a coaxial network. The wireless premises network **208** may support the Bluetooth communications protocol standard, wireless premises network **206** may support one or more versions IEEE 802.11x protocol standards, and wired premises network **204** may support one or more optical and/or coaxial communication protocol standards. As is shown, the wired premises network **202**, wireless premises network **206**, wireless premises network **208** and wired premises network **204** inter-couple to one another via various wired and/or wireless communication links. For example, hubs, routers, or other interconnection devices may inter-couple these networks **202**, **204**, **206**, and **208** for supported intercommunication.

The premises based multimedia communication system of FIG. **2** further includes source device **210**, source device **212**, source device **216** and source device **218**, source device **220**, and source device **222**. The premises multimedia communication system further include rendering device **224**, rendering device **226**, rendering device **228**, and rendering device **230**. Note that within the embodiment of FIG. **2**, the various rendering devices and source devices inter-couple to one or more wired and/or wireless networks via service wireless communication links.

The premises based multimedia communication system of FIG. **2** further includes control devices **234**, **236**, and **238**. Each of these control devices **234**, **236**, and **238** may be capable of controlling the transfer of multimedia content from a source device to a rendering device. For example, control device **238** may be a cell phone that has enabled according to the DLNA operational standards. In such case, the control device **238**, which is a cell phone, may be employed to control one or more of the source devices and/or rendering devices illustrated in FIG. **2**. Likewise, control devices **234**, which may be a laptop computer, and **236**, which may be a desktop computer, may also support the DLNA standardized operations. According to the DLNA standardized operations, the control devices **234** and **236** may be employed to control any of the source devices and/or rendering devices of the premises based multimedia communications systems.

The premises based multimedia communications systems of FIGS. **1** and **2** support the various operations of the present invention will be described further herein with reference to FIGS. **4** through **13** The structure of a source device/rendering device/control device generally will be described with reference to FIG. **3**. However, the structure of these devices may differ in other embodiments than that which is described with reference to FIG. **3**.

FIG. **3** is a block diagram illustrating generally the construct of a source device, a rendering device, and/or a control device constructed according to one or more embodiments of the present invention. The device **302** of FIG. **3** may take different forms in its differing embodiment. For example, the structure illustrated in FIG. **3** may be germane to a laptop or desktop computer but only partially germane to a cellular telephone. The device **302** includes processing circuitry **304**, memory **306**, a communications interface **308**, and a user interface. With the structure of the device **302** of FIG. **3**, the processing circuitry **304** may be a microprocessor, a digital signal processor, customized processing logic, generalized processing logic, or another type of circuitry that is capable of executing instructions to implement operations of the present invention. Thus, with the device of **302** of FIG. **3**, the processing circuitry **304** performs personal computer operations, protocol stack operations **338**, and Digital Rights Management (DRM) operations **340**, among other operations.

The memory **306** of the device **302** of FIG. **3** is one or more of RAM, ROM, DRAM, Flash RAM, magnetic storage, optical storage, or other storage capable of storing digital information, which includes data and computer software instructions. The memory **304** stores video processing instructions **324**, protocol stack instructions **326**, encoding/decoding instructions **328**, and encryption/decryption (DRM) instruction **330**. Of course, the device **302** stores additional instructions as well for performing other of its conventional operations. Generally, the software instructions **324**, **326**, **328**, and/or **330** are retrieved by processing circuitry **304** and

executed to perform the operations of embodiments of the present invention, among other operations as are described further herein.

The user interface may include one or more user input interfaces **314** and/or one or more user output interfaces **314**. The user input interface(s) **312** interface with one or more user input devices such as headset **322**, mouse **320**, and keyboard **318**. User output interface(s) **314** interface with video monitor **316** and may interface with other devices such as speakers, etc. Of course, other user input and other user output devices may be employed with differing embodiments of the device **302** of the present invention.

The device **302** also includes decoding circuitry **334**, encoding circuitry **336**, and encryption/decryption (DRM) circuitry **336** in the illustrated embodiment. In other embodiments, the device **302** may include other specialized circuitry as well. Further, with the embodiment of FIG. **3**, the decoding circuitry **334**, encoding circuitry **336**, and/or encryption/decryption circuitry **338** may not be replaced/performed by functionality executed by the processing circuitry **334** instead.

The user should understand that the structure illustrated in FIG. **3** for such a source device/rendering device/control device **302** is only generally shown. In various embodiments that support the principles of the present invention, various devices will have different structures and still fall within the scope of the present invention claim below. The structure of FIG. **3** is used generally to illustrate one example of the device that could implement the operations in structures of the present invention.

FIG. **4** is a flow chart illustrating operations for the transfer of multimedia content according to an embodiment of the present invention. With the operations **400** of FIG. **4**, a premises based multimedia communication system includes at least one source device that produces multimedia content, at least one rendering device that presents the multimedia content, and at least one premises communications network coupling the source device to the rendering device. Such a structure is illustrated previously in FIGS. **1** and **2** and describes in conjunction therewith.

The operations **400** in FIG. **4** commence with certifying the transfer of multimedia content from the source device to the rendering device via at least one premises network (Step **402**). Because the multimedia content is protected via DRM in many embodiments, a source device typically will require cooperation with a rendering device prior to initiating transfer of the multimedia content. One example of such certification occurs according the DLNA operating standards. Particularly, the DLNA standard requires that DRM be supported in some embodiments and some operations by encryption at a link layer of a supported protocol communications stack. Referring temporarily to FIG. **10**A, such a protocol stack **1000** as illustrated. As shown in FIG. **10**A, link layer **1006** resides between content layer **1004** and physical layer **1008**. According to the DLNA operations, link layer encryption must be used to protect content. However, because one or more of the premises communication networks servicing transfer of the multimedia content from the source device to the rendering devices have a bit error rate that is insufficient to support such link layer encryption operations. Thus, the operations **400** in FIG. **4** overcome such performance of the at least one premises communication network and also protect transmitted content from a DRM perspective.

According to the operations **400** of FIG. **4**, certification for transfer of the multimedia content from the source device to the rendering device of Step **402** is performed until certification is completed in Step **404**. After certification of the transfer of the multimedia content from the source device to the rendering device via at least one premises communication network using link layer encryption operations, the link layer encryption operation are at least partially disabled (Step **406**), as will be further described herein with reference to subsequent FIGs. However, in order to ensure that the transfer of multimedia content from the source device to the rendering device is protected, according to the operations **400** in FIG. **4**, content layer encryption operations are at least partially enabled (Step **408**). The content layer encryption operations are at least partially enabled at Step **408** for the transfer of the multimedia content from the source device to the rendering device via at least one premises communication network. Thus, after conclusion of the operations of Step **408**, operations **400** include transferring multimedia content from the source device to the rendering device using at least partially disabled link layer encryption operations and at least partially enabled content layer encryption operations (Step **410**). With these operations, the link layer encryption may include Digital Transmission Content Protection over Internet Protocol (DTCP/IP) or Link Privacy for Multimedia over Coax (MoCA). Various content layer encryption operations may be employed according the operations **400** in FIG. **4**, including, but not limited to using Traffic Encryption Keys (TEKs), for example.

The operations of **400** in FIG. **4** may include a whether the encryption operations that are currently being used is sufficient (Step **412**). Determining whether encryption operations are sufficient may be based upon the performance of the at least one premises communication network in, the quality of video being transported via the at least one premises communication network with the particular enabled encryption operations, or based upon other criteria. For example, if the at least one premises communication network is fully supporting the use of content layer encryption and link layer encryption but link layer encryption had been previously disabled, it may be appropriate to alter one or more of the link layer and/or content layer encryption operations (Step **414**). Further, if at least one of the premises communications networks can still not sufficiently transport the multimedia content from the source device to the rendering device, the operations in Step **414** may further include altering one or more of the link layer encryption operations and/or the content layer encryption operations to reduce data throughput requirements or processing requirements of the source device and/or rendering device.

After the operations of Steps **412** and **414**, the method **400** includes determining whether or not transfer of the multimedia content is completed from the source device to the rendering device (Step **416**). If so, operation returns to Step **402** when the certification operations may be setup. If not, the operation proceeds to Step **410** where the multimedia content continues to be transferred from the source device to the rendering device. As the reader should appreciate from the description of FIG. **4**, the content and/or link layer encryption operations employ may be tailored over time to suit the availability or quality of the at least one premises communication network. Further, these operations may be adjusted based upon the quality of the video and/or audio that is being delivered from the source device to the rendering device.

FIGS. **5**A and **5**B are flow charts illustrating particular embodiments of the operations of FIG. **4**. Referring now to FIG. **5**A, one particular embodiment of the Steps **406** and **408** of FIG. **4** are illustrated. With the embodiment of FIG. **5**A, at least partially disabling link layer encryption operations and at least partially enabling content layer encryption operations for the transfer of the multimedia content from the source

device to the rendering device via the at least one premises communications network includes encrypting video frames of the multimedia content using content layer encryption (Step **502**). Further, the operations of FIG. **5**A include ceasing all link layer encryption for the multimedia content transfer (Step **504**).

Because the video frames of the multimedia content, which may be encoded to the MPEG operating standard, require much greater data throughput than does the audio content, the manner in which video frames are processed is particularly described with reference to FIG. **5**A. As is generally known, the transfer of video multimedia content may heavily load a servicing network. Further, the transmission, receipt, and processing related to transfer of video frames may over load transmitting and receiving devices. Encryption operations further add to the complexity. When using link layer encryption, errors caused by the transport path are not discoverable at the link layer due to the encryption. Thus, errors in the video frame of the multimedia content propagate and severely degrade the quality of video transfer from the source device to the rendering device. For at least this reason, it is desirable in some operations to fully disable link layer encryption for the transfer of video frames.

Referring now to FIG. **5**B, another embodiment of the Steps **406** and **408** of FIG. **4** is shown. Within the embodiment of FIG. **5**B operations include transferring independent frames of the multimedia content without encryption (**502**) while transferring at least some predictive video frames with encryption (Step **504**). With the embodiment of FIG. **5**B, forward predictive P frames and/or backwards predictive B frames of the video frames stream may be transmitted using one or more of content layer and link layer encryption. However, with this technique, processing requirements for the encryption and decryption of the video frames are reduced while still providing protection of the media content with regard to DRM. Further, when a predictive video frame is transmitted with errors, it may simply be discarded without creating significant errors in an output video stream.

FIGS. **6**A and **6**B are flow charts illustrating particular embodiments consistent with the operations of FIG. **4**. With the embodiment of FIG. **6**A, the independent video frame stream of the multimedia content transfer is transferred with encryption (Step **502**). Further, at least some predictive video frames are transferred without encryption (Step **504**). The operations of Step **502** may include encrypting the independent video frames with content layer encryption. Alternatively, the operations of Step **502** may include transferring independent video frames with link layer encryption. With the embodiment of FIG. **6**A, protection of video frames for DRM purposes is at least partially accomplished by using encryption for the independent video frames. However, by not using encryption for predictive video frames, errors created due to corruption of data transfer are reduced because link layer error detection and elimination operations are enabled.

Referring now to FIG. **6**B, still another embodiment of the Steps **406** and **408** of FIG. **4** is illustrated. With the operations of FIG. **6**B, independent video frames are transferred from the source device to the rendering device using content layer encryption (Step **652**) while at least some predictive video frames are transferred using link layer encryption. With the operation of Step **654**, some of the predictive video frames may be encrypted using link layer encryption while others may not be encrypted. With the operations of FIG. **6**B, DRM considerations are addressed by using encryption at the content layer for the independent video frames even though link layer encryption operations are not employed for the independent video frames. Further, by using link layer encryption for at least some of the predictive video frames, DRM concerns are also addressed.

FIG. **7** is a flow chart illustrating particular embodiments consistent with the operations of FIG. **4**. With the embodiment of FIG. **7**, operation includes transferring independent video frames from the source device to the rendering device using link layer encryption (Step **702**). Further, the operation of FIG. **7** includes transferring at least some predictive video frames using content layers encryption (Step **704**). Thus, with the operations of FIG. **7**, some characteristics of standardized DLNA content or DRM are preserved by using link layer encryption for independent video frames. However, by transferring at least some predictive video frames using content layer encryption, the risk of error propagation is reduced by removing link layer encryption operations for such predictive video frames.

FIG. **8** is a flow chart illustrating one or more alternate embodiments of operations for the transfer of multimedia content according to the present invention. Generally, the operations **800** of FIG. **8** consider the performance of the at least one premises communication network of the premises based multimedia communication system in making encryption decisions. Further, generally, when a supported bit error rate of one or more servicing premises communication networks is relatively higher, relatively lesser encryption is employed. This is because more bit errors must be corrected to overcome the relatively higher bit error rate of the servicing network.

Operations **800** commence with the determining a bit error rate between the source device and the destination device (Step **802**). Determining this bit error rate typically requires cooperative effort between the source device and the designation device. For example, referring again to FIG. **2**, a source device **210** may desire to transmit multimedia content to rendering device **230**. In such a transfer of content, wired premises network **202** and wired premises network **204** are employed. In combination, the wired premises networks **202** and **204** have a bit rate that is relatively high as compared to a required bit error rate for transfer of the content. The source device **210** and rendering device **230** cooperatively determine this bit error rate by empirical operations.

Referring again to FIG. **8**, once the bit error rate is determined, the source device (typically) will compare the bit error rate to a bit error rate threshold (Step **804**). The bit error rate threshold is a threshold in a particular bit error rate, for example 10^{-6}, that is deemed a bit error rate that is appropriate for altering encryption operations. Thus, upon an unfavorable comparison of Step **806**, operations includes disabling link layer encryption operations (Step **808**) and at least partially enabling content layer encryption operations (Step **812**). However, when there is not an unfavorable comparison of the bit error rate and the bit error rate threshold at Step **804**, as determined at Step **806**, operations proceeds to enabling standardized encryption operations (Step **816**). For example, within a DLNA network, the standardized encryption operations include link layer encryption.

From both Steps **816** and **812**, operation includes transferring multimedia content from the source device to the rendering device using enabled encryption operations (Step **814**). With the operations of Step **814**, the multimedia content is transferred from the source device to the rendering device using the encryption operations that are established at Steps **816**, **808**, **812**, and **816**. Of course, the operations at Steps **808** and **812** that deviate from the operational standards may include deceiving the devices supporting the transfer, the

source device and destination device into believing that link layer encryption is used according to the standardized operations, e.g., DLNA operations.

The multimedia content is transferred until the operations are complete (Step **818**). At any point and time during the transfer of the multimedia content from the source device to the rendering device, one or more of the source and rendering devices may further characterize the communication link between the source device and the rendering device. Should bit error rate of the premises communication networks compare favorably or unfavorably in contradiction to prior comparison, the encryption operations that have been previously established may be altered. In one example of such operations, the bit error rate of the servicing network decreases such that the full link layer encryption operations may be serviced. Alternatively, the other operations, the servicing premises communication networks initially provided a lower bit error rate now operating at a higher bit error rate so that one or more link layer and/or content layer encryption operations must be ceased.

FIG. **9** is a flow chart illustrating other embodiments of operations for the transfer of multimedia content according to the present invention. Operations of **900** are accomplished within a premises based multimedia communication system having at least one source device that produces multimedia content that at least one rendering device that presents the multimedia content and at least one premises communication network coupling the source device from the rendering device. Operations commence with the source and destination devices initiating transfer of multimedia content from the source device to the rendering device via one or more premises networks (Step **902**).

With the operations of **900** in FIG. **9**, Step **904** includes transferring independent video frames using a first encryption type while Step **906** includes transferred predictive video frames using a second encryption type. The various embodiments of FIGS. **5**A through **7** may be employed with the operations of **900** of FIG. **9**. For example, the independent video frames may be transferred using content layer encryption while the predictive video frames may be transferred using link layer encryption. Alternatively, the first encryption type may include no encryption while the second encryption type may include one or more of link layer and content layer encryption. Still alternatively, the first encryption type may include link layer encryption while the second encryption type may include no encryption. Still further, the first encryption type may include content layer encryption while the second encryption type may include no encryption or link layer encryption. Still further, the first encryption type may include link layer encryption while the second encryption type may include content layer encryption.

The operations **900** in FIG. **9** may be employed in conjunction with the operations **800** in FIG. **8**; the operations **900** particularly relevant to the operations of Steps **808** and **812** of FIG. **8**. As the reader will appreciate, in order to sufficiently enable the transfer of video frames between the source device and the rendering device, encryption operations may have to be modified so that they are not consistent with a supported standard, e.g. DLNA standard. Further, the encryption techniques must or should sufficiently protect content transferred from the source device to the destination device to provide sufficient DRM. Thus, these competing interests may be met when needed due to potential shortcomings of the servicing premises communication networks.

FIGS. **10**A and **10**B illustrate various embodiments of protocol stack construct(s) supporting the operations of the present invention. FIGS. **10**A and **10**B are examples of protocol stacks supported by the DLNA standards. The protocol stacks **1000** and **1050** of FIGS. **10**A and **10**B respectively, includes components that are generically recognizable as being components of the OSA protocol stack. However, the particular components of the protocol stacks of FIGS. **10**A and **10**B are unique to the teaching of the present invention.

Referring particularly to FIG. **10**A, protocol stack **1000** includes upper protocol layers **1002**, content protocol layer **1004**, link protocol layer **1006**, and physical layer **1008**. Also shown in FIG. **10**A is optional protocol layer link privacy layer **1007** which is employed when the MoCA protocol stack is embodied. Where the protocol stack **1000** is consistent with the DLNA operating standard, the link layer supports link layer encryption operations. The link layer encryptions operations are employed to protect the digital rights of the content being transferred from the source device to the rendering device. However, encryption of the link layer is problematic when the transferring network introduces bit errors into the transport stream that exceed a supportable bit error rate threshold. Because of the encryption operations with standard DLNA operations, the link layer **1006** is not able to correct errors introduced by such transport network and these errors are passed up the protocol suite, resulting in noticeable errors in the video output produced from the encoded video stream. Thus, according to the present invention, content layer modification **1010** and link layer modification **1012** are introduced into the content layer **1004** and the link layer **1006**, respectively. The content layer modification **1010** and the link layer modification **1012** support operations previously described in reference to FIGS. **1** through **9**.

Referring now to FIG. **10**B, another embodiment of the protocol stack **1050** according to the present invention illustrated. The protocol stack of FIG. **10**B includes upper protocol layers **1052**, content layer **1054**, link layer **1056** and physical layer **1058**. These layers are consistent with the non-MoCA embodiment of the protocol stack **1000** of FIG. **10**A. However, with the embodiment of protocol stack **1050** of FIG. **10**B, a content/link layer shim **1064** exist between the content layer **1054** and the link layer **1056**. Further, a link/physical layer shim **1066** is in place between link layer **1056** and the physical layer **1058**. Further, in some embodiments content layer modification **1060** and link layer modification **1062** may also be employed with the embodiment of the protocol stack **1050** of FIG. **10**B. In order to implement the operations of the present invention previously described in reference to FIGS. **1** through **9**, with the protocol stack **1050** of FIG. **10**B, the shims **1064** and **1066** inter-operate with the respectively adjacent protocol layers to accomplish the previously (and subsequently) described operations.

FIG. **11** is a flow chart illustrating operations of a premises based multimedia communication system according to another embodiment of the present invention. The operations **1100** of FIG. **11** commence with the source device receiving data packets carrying multimedia content from a remote content source via at least one remote delivery communication network (Step **1102**).

Referring again to FIG. **1**, the source device may be one of source devices **106**, **108**, and/or **110**. Each of these source devices **106**, **108**, and **110** receives multimedia content from a remote content source coupled to the source device via at least one remote delivery communication network. With respect to source device **106** the source device **106** receives the multimedia content via wireless mechanism such as satellite communication system, cellular communication system, WWAN communication system or another communication system. With reference to the source device **108**, the source device **108** receives the multimedia content from a

remote content source via cable modem network **122**. Finally, with reference to the source device **110**, the source device **110** receives multimedia content from a remote content source via the Internet **124**. Connection to the Internet may be via one or more high speed wired connections.

Referring again to FIG. **11**, the source device transmits at least two copies of data packets carrying video frames of the multimedia content to a rendering device via at least one premises communication network (Step **1104**). As previously described, multimedia content is carried in data packets that are digitally transmitted from the source device to the rendering device. In one particular embodiment, the multimedia content includes both audio content and video content. The multimedia content may further include control information and additional information such as Meta data. As has also been previously described, the video content and audio content are separately encoded prior to transmission from the remote content source of the source device and embodiments. Encoding of video content may be accomplished according to the MPEG compression/encoding standard. In such case, video frames of the multimedia content include independent video frames and predictive video frames, as also have been previously described herein. Thus, with the operations of Step **1104**, the source device transmits at least two copies of data packets carrying video frames to the rendering device via the premises communication network.

Referring again to FIG. **1**, the source device **108**, for example, transmits at least two copies of data packet carrying video frames to rendering device **112** via premises communication network **102**. Referring to FIG. **2**, the source device **220**, for example, transmits at least two copies of the data packets carrying video frames via multiple components of the premises communication networks. With this example, source device **220** receives multimedia content via communication link and transmits the multimedia content to rendering device **226** via wired premises network **204** and wired premises network **202**. Likewise, source device **220** may transfer the multimedia content to rendering device **228** via wired premises network **204** and wireless premises network **208**. Each of the components of the premises communication network, i.e., **202**, **204**, **206**, and **208** has unique performance characteristics from a bit error rate prospective. For example, wired premises network **204** may have a relatively low bit error rate while wireless premises network **208** may have a higher bit error rate. Further, wired premises network **204**, which may be an optical network that has a relatively lower bit error rate than the Ethernet embodiments of the wired premises network **202**. In both cases, the components of the premises communication network may have a relatively higher bit error rate for transmission from source device **220** to rendering device **226** or **228** than does the remote delivery communication network that carries the multimedia content from a remote content source to the source device **220**.

With the source device **220** of FIG. **2**, the communication link coupling the source device **220** to the remote content source via at least one remote delivery communication network has a relatively lower bit error rate, e.g., 10^{-3}, than those the communication link coupling source device **220** to rendering device **226** or **228**, e.g., 10^{-6}. Thus, according to the present invention, the source device transmits at least two copies of data packets carrying video frames and multimedia content to rendering device **226** or **228** via at least one premises communication network.

Referring again to FIG. **11**, the rendering device then receives the at least two copies of the data packet carrying video frames from the source device via the premises communication network (Step **1106**). The rendering device then decodes a first copy of the video frame extracted from the data packets received at (Step **1106** and Step **1108**). If the decoding of the first copy of the video frame is successful as determined in Step **1110**, the rendering device discards or ignores the second copy of the video frame (**1114**). However, if the decoding performs at Step **1108** is unsuccessful as determined at Step **1110** the rendering device decodes the second copy of the video frame (Step **1112**). Operations from Step **1112** and **1114** returns to Step **1102**.

Although the embodiments of the operations **1100** of FIG. **11** disclose only the transmission of two copies of data packets carrying video frames of the multimedia content to the rendering device, the principles of the present invention may be expanded to transmit a great number of copies of data packets carrying video frames should the error rate of the premises communication network justify such transmissions. Further, the principles of the embodiment of FIG. **11** may be applied to audio data packets as well. However, as the reader should understand, digital audio content transmission is less susceptible to bit errors during transmission since such errors would simply result in degradation of voice quality. With video content however, errors in transmission of the video frames and their respective unsuccessful coding will result in noticeable problems with a viewed video stream. When these errors particularly relate to independent video frames, artifacts created due to these errors may extend across multiple frames.

With the operations **1100** in FIG. **11**, the multiple transmissions of the data packets carrying video frames to the multimedia content from the source device to the rendering device via at least one premises communication network are irrespective/independent of any Automatic Re-transmission reQuest (ARQ) operations that may be supported by the source device and the rendering device. Thus, even though ARQ operations may be employed to correct the errors, the transmission of multiple copies of the data packets carrying the video frames is also independently employed.

FIG. **12** is a flow chart illustrating yet another operation of a source device of the premises multimedia communication system according to an embodiment of the present invention. The operations **1200** of FIG. **12** commence with the source device and rendering device determining a bit error rate there between that is supported by at least one premises network (Step **1202**). This bit error rate is representative of the communication path within the premises communication network between the source device and the destination device. In a typical premises communication network, the bit error rate may be 10^{-3} while a bit error rate supported by a remote delivery communication network over which the source device receives the multimedia content may be characterized by a 10^{-6} bit error rate, for example. Thus, the transmission quality supported by the premises communication network may be relatively worse than that supported by the remote delivery communication network. Alternatively, Step **1202** may characterize the performance of the at least one premises communication network in a different fashion. This fashion may be a signal-to-noise ratio of other characterization of the quality of the communication link between the source device and the rendering device.

The source device then compares the bit error rate supported by at least one premises communication network to a bit error rate threshold of (Step **1204**). The bit error rate threshold is a bit error rate characterization that is determined to be sufficient for transfer of multimedia content from the source device to the destination device to provide acceptable video quality. When the comparison is unfavorable, as determined in Step **1206**, the source device transmits multiple

copies of data packets carrying video frames to the rendering device (Step **1210**). Alternatively, when the comparison is favorable as determined in Step **1206**, the source device singularly transmits data packets carrying video frames to the rendering device (Step **1208**).

From each of Steps **1208** and **1210**, operations may return to Step **1202**. However, the operations of each of Steps **1208** and **1210** may continue until the multimedia transfer is complete. For example, once the source device determines that multiple transmissions of data packets carrying video frames are required, the source device will transmit the multiple copies of the data frames carrying video frames until the video transfer ends. Likewise, when the source device determines that singular transmission of data packets carrying video frames to the rendering device it is warranted such singular transmission will continue until the transfer of the video content has been fully completed. However, at any point in time, the source device may re-evaluate its decision whether to singularly or multiply transmit data packets carrying video frames to the destination device by returning to Step **1202**.

FIG. **13** is a flow chart illustrating a particular operation according to the embodiment of FIGS. **11** and **12**. The operations of **1300** of FIG. **13** include the source device initiating transfer of multimedia content to a rendering device via the premises communication network (Step **1302**). Operations continue with the source device transmitting multiple copies of data packets carrying independent video frames to the rendering device (Step **1304**). Further, the operations **1300** of FIG. **13** include the source device singularly transmitting data packets carrying predictive video frames to the rendering device (Step **1306**). The operations **1300** of FIG. **13** are performed because the error free receipt of independent video frames reduces the detectible problems associated with bit errors in the transfer of the data packets from the source device to the rendering device more than does the multiple copy transfer of the predictive video frames.

The terms "circuit" and "circuitry" as used herein may refer to an independent circuit or to a portion of a multifunctional circuit that performs multiple underlying functions. For example, depending on the embodiment, processing circuitry may be implemented as a single chip processor or as a plurality of processing chips. Likewise, a first circuit and a second circuit may be combined in one embodiment into a single circuit or, in another embodiment, operate independently perhaps in separate chips. The term "chip," as used herein, refers to an integrated circuit. Circuits and circuitry may comprise general or specific purpose hardware, or may comprise such hardware and associated software such as firmware or object code.

The present invention has also been described above with the aid of method steps illustrating the performance of specified functions and relationships thereof. The boundaries and sequence of these functional building blocks and method steps have been arbitrarily defined herein for convenience of description. Alternate boundaries and sequences can be defined so long as the specified functions and relationships are appropriately performed. Any such alternate boundaries or sequences are thus within the scope and spirit of the claimed invention.

The present invention has been described above with the aid of functional building blocks illustrating the performance of certain significant functions. The boundaries of these functional building blocks have been arbitrarily defined for convenience of description. Alternate boundaries could be defined as long as the certain significant functions are appropriately performed. Similarly, flow diagram blocks may also have been arbitrarily defined herein to illustrate certain significant functionality. To the extent used, the flow diagram block boundaries and sequence could have been defined otherwise and still perform the certain significant functionality. Such alternate definitions of both functional building blocks and flow diagram blocks and sequences are thus within the scope and spirit of the claimed invention. One of average skill in the art will also recognize that the functional building blocks, and other illustrative blocks, modules and components herein, can be implemented as illustrated or by discrete components, application specific integrated circuits, processors executing appropriate software and the like or any combination thereof.

As may be used herein, the terms "substantially" and "approximately" provides an industry-accepted tolerance for its corresponding term and/or relativity between items. Such an industry-accepted tolerance ranges from less than one percent to fifty percent and corresponds to, but is not limited to, component values, integrated circuit process variations, temperature variations, rise and fall times, and/or thermal noise. Such relativity between items ranges from a difference of a few percent to magnitude differences. As may also be used herein, the term(s) "coupled to" and/or "coupling" and/or includes direct coupling between items and/or indirect coupling between items via an intervening item (e.g., an item includes, but is not limited to, a component, an element, a circuit, and/or a module) where, for indirect coupling, the intervening item does not modify the information of a signal but may adjust its current level, voltage level, and/or power level. As may further be used herein, inferred coupling (i.e., where one element is coupled to another element by inference) includes direct and indirect coupling between two items in the same manner as "coupled to." As may even further be used herein, the term "operable to" indicates that an item includes one or more of power connections, input(s), output(s), etc., to perform one or more its corresponding functions and may further include inferred coupling to one or more other items. As may still further be used herein, the term "associated with," includes direct and/or indirect coupling of separate items and/or one item being embedded within another item. As may be used herein, the term "compares favorably," indicates that a comparison between two or more items, signals, etc., provides a desired relationship. For example, when the desired relationship is that signal **1** has a greater magnitude than signal **2**, a favorable comparison may be achieved when the magnitude of signal **1** is greater than that of signal **2** or when the magnitude of signal **2** is less than that of signal **1**.

The present invention has also been described above with the aid of method steps illustrating the performance of specified functions and relationships thereof. The boundaries and sequence of these functional building blocks and method steps have been arbitrarily defined herein for convenience of description. Alternate boundaries and sequences can be defined so long as the specified functions and relationships are appropriately performed. Any such alternate boundaries or sequences are thus within the scope and spirit of the claimed invention.

Moreover, although described in detail for purposes of clarity and understanding by way of the aforementioned embodiments, the present invention is not limited to such embodiments. It will be obvious to one of average skill in the art that various changes and modifications may be practiced within the spirit and scope of the invention, as limited only by the scope of the appended claims.

The invention claimed is:

1. A method for use in a premises based multimedia communication system having at least one source device that produces multimedia content, at least one rendering device that presents the multimedia content, and at least one premises communication network coupling the source device to the rendering device, the method comprising:

determining a bit error rate of the at least one premises communication network between the source device and the rendering device;

transferring the multimedia content from the source device to the rendering device via the at least one premises communication network;

when the bit error rate exceeds a bit error rate threshold, at least partially disabling link layer encryption of video frames of the multimedia content transfer, wherein at least partially disabling link layer encryption includes:

transferring at least some independent video frames of the multimedia content using content layer encryption; and

transferring at least some predictive video frames of the multimedia content without encryption.

2. The method of claim 1, wherein the link layer encryption comprises Digital Transmission Content Protection over Internet Protocol (DTCP/IP).

3. The method of claim 1, wherein the at least partially disabling link layer encryption further comprises disabling link layer encryption of the independent video frames.

4. The method of claim 1, further comprising, when the bit error rate exceeds the bit error rate threshold:

disabling link layer encryption of predictive video frames of the multimedia content.

5. The method of claim 1, further comprising, when the bit error rate exceeds the bit error rate threshold:

transferring other independent video frames of the multimedia content without encryption.

6. The method of claim 1, further comprising, when the bit error rate exceeds the bit error rate threshold:

transferring at least some other predictive video frames of the multimedia content using link layer encryption.

7. The method of claim 1, further comprising deceiving at least one of the source device and the rendering device that link layer encryption continues to be implemented for the video frames of the multimedia content transfer.

8. A source device used to transfer multimedia content to a rendering device, the source device comprising:

communications circuitry configured to transfer the multimedia content from the source device to the rendering device via a premises communication network, the communications circuitry capable of transferring the multimedia content using different encryption techniques;

processing circuitry configured to determine a bit error rate of a premises communication network coupling the source device and the rendering device;

in response to the processing circuitry determining that the bit error rate exceeds a bit error rate threshold, at least partially disabling link layer encryption for at least some video frames of the multimedia content transfer, wherein at least partially disabling link layer encryption includes:

transferring at least some independent video frames of the multimedia content from the source device to the rendering device using content layer encryption; and

transferring at least some predictive video frames of the multimedia content from the source device to the rendering device using link layer encryption.

9. The source device of claim 8, wherein the link layer encryption comprises Digital Transmission Content Protection over Internet Protocol (DTCP/IP).

10. The source device of claim 8, wherein the at least partially disabling link layer encryption includes disabling link layer encryption of the independent video frames of the multimedia content.

11. The source device of claim 8, wherein the at least partially disabling link layer encryption includes disabling link layer encryption of the predictive video frames of the multimedia content.

12. The source device of claim 8, wherein at least partially disabling link layer encryption includes:

transferring other independent video frames of the multimedia content from the source device to the rendering device using link layer encryption.

13. The source device of claim 8, wherein at least partially disabling link layer encryption includes:

transferring other predictive video frames of the multimedia content from the source device to the rendering device without encryption.

14. The source device of claim 8, wherein at least partially disabling link layer encryption includes:

transferring other independent video frames of the multimedia content from the source device to the rendering device without.

15. The source device of claim 8, wherein at least partially disabling link layer encryption includes:

deceiving at least one of the source device and the rendering device that link layer encryption continues to be implemented for all video frames of the multimedia content transfer.

16. A source device used to transfer multimedia content to a rendering device, the source device comprising:

processing circuitry configured to determine a bit error rate of at least one premises communication network between the source device and the rendering device;

encryption circuitry configured to at least partially disable link layer encryption operations for the transfer of the multimedia content from the source device to the rendering device via the at least one premises communication network based on the bit error rate;

the processing circuitry further configured to at least partially enable content layer encryption operations for the transfer of the multimedia content from the source device to the rendering device via the at least one premises communication network when the link layer operations are at least partially disabled, and wherein at least partially enabling content layer encryption includes:

transferring at least some independent video frames of the multimedia content from the source device to the rendering device using content layer encryption; and

transferring at least some predictive video frames of the multimedia content from the source device to the rendering device using link layer encryption.

17. The source device of claim 16, wherein the link layer encryption operations comprise Digital Transmission Content Protection over Internet Protocol (DTCP/IP).

18. The source device of claim 16, wherein at least partially disabling the link layer encryption operations and at least partially enabling content layer encryption operations for the transfer of the multimedia content from the source device to the rendering device via the at least one premises communication network comprises:

ceasing link layer encryption of other predictive video frames of the multimedia content transfer.

19. The source device of claim 16, wherein at least partially disabling the link layer encryption operations and at least partially enabling content layer encryption operations for the transfer of the multimedia content from the source device to the rendering device via the at least one premises communication network comprises:

transferring other independent video frames of the multimedia content without encryption.

20. The source device of claim 16, wherein at least partially disabling the link layer encryption operations and at least partially enabling content layer encryption operations for the transfer of the multimedia content from the source device to the rendering device via the at least one premises communication network comprises:

transferring other independent video frames of the multimedia content using link layer encryption.

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